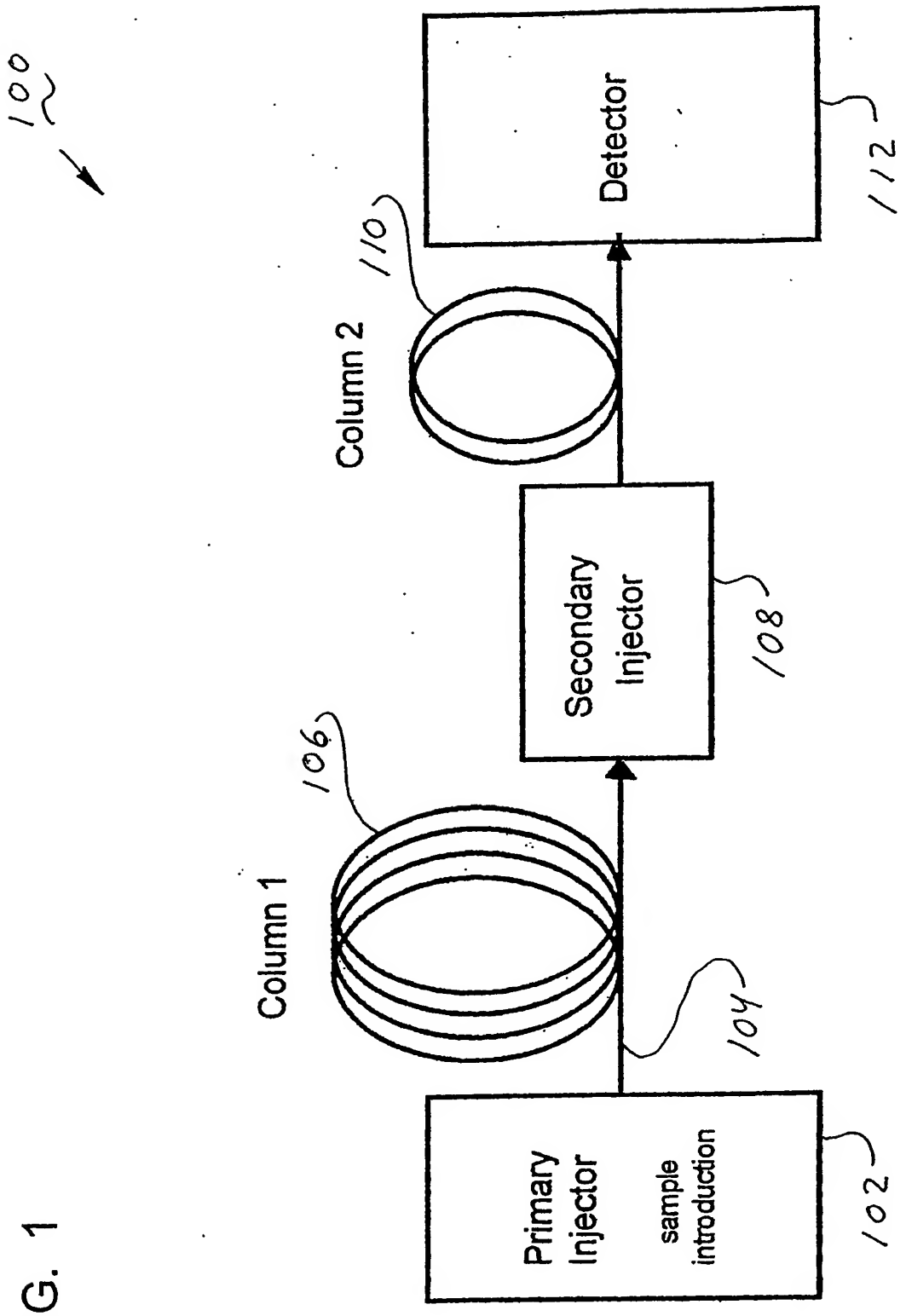

100
Primary Injector
sample introduction
102
104
Column 1
106
Secondary Injector
108
Column 2
110
Detector
112

FIG. 1

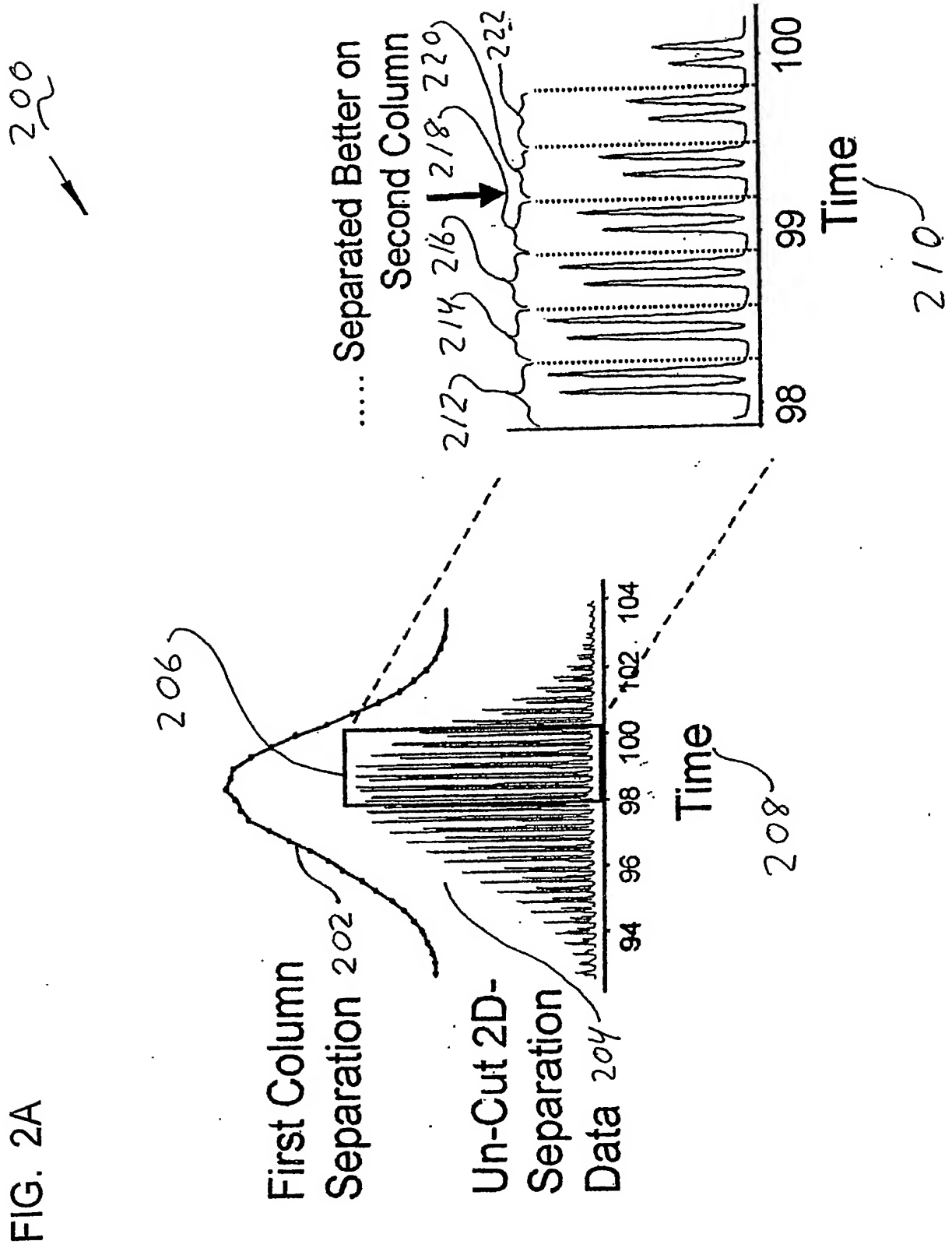
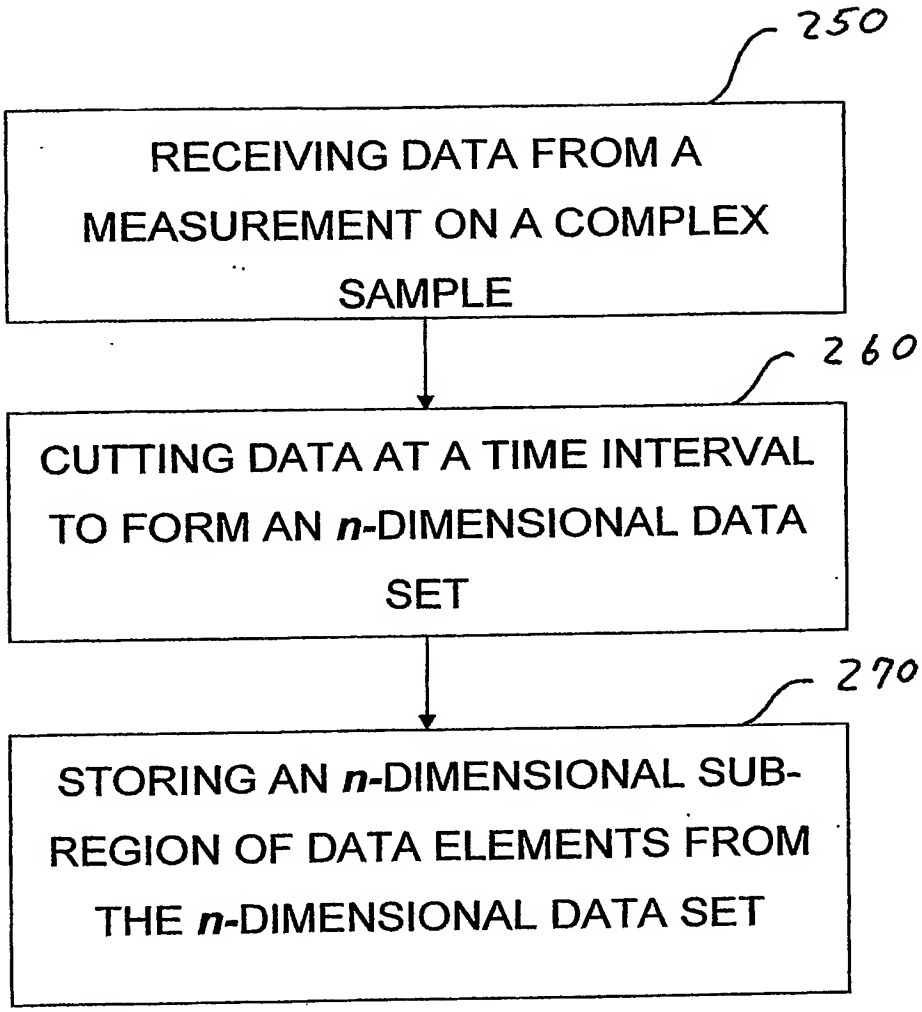

206
First Column Separation 202
Un-Cut 2D-Separation Data 204
94
96
98
100
102
104
Time
208
..... Separated Better on Second Column
212
214
216
218
220
222
98
99
100
Time
210

FIG. 2A

FIGURE 2B


250
RECEIVING DATA FROM A MEASUREMENT ON A COMPLEX SAMPLE
260
CUTTING DATA AT A TIME INTERVAL TO FORM AN *n*-DIMENSIONAL DATA SET
270
STORING AN *n*-DIMENSIONAL SUB-REGION OF DATA ELEMENTS FROM THE *n*-DIMENSIONAL DATA SET

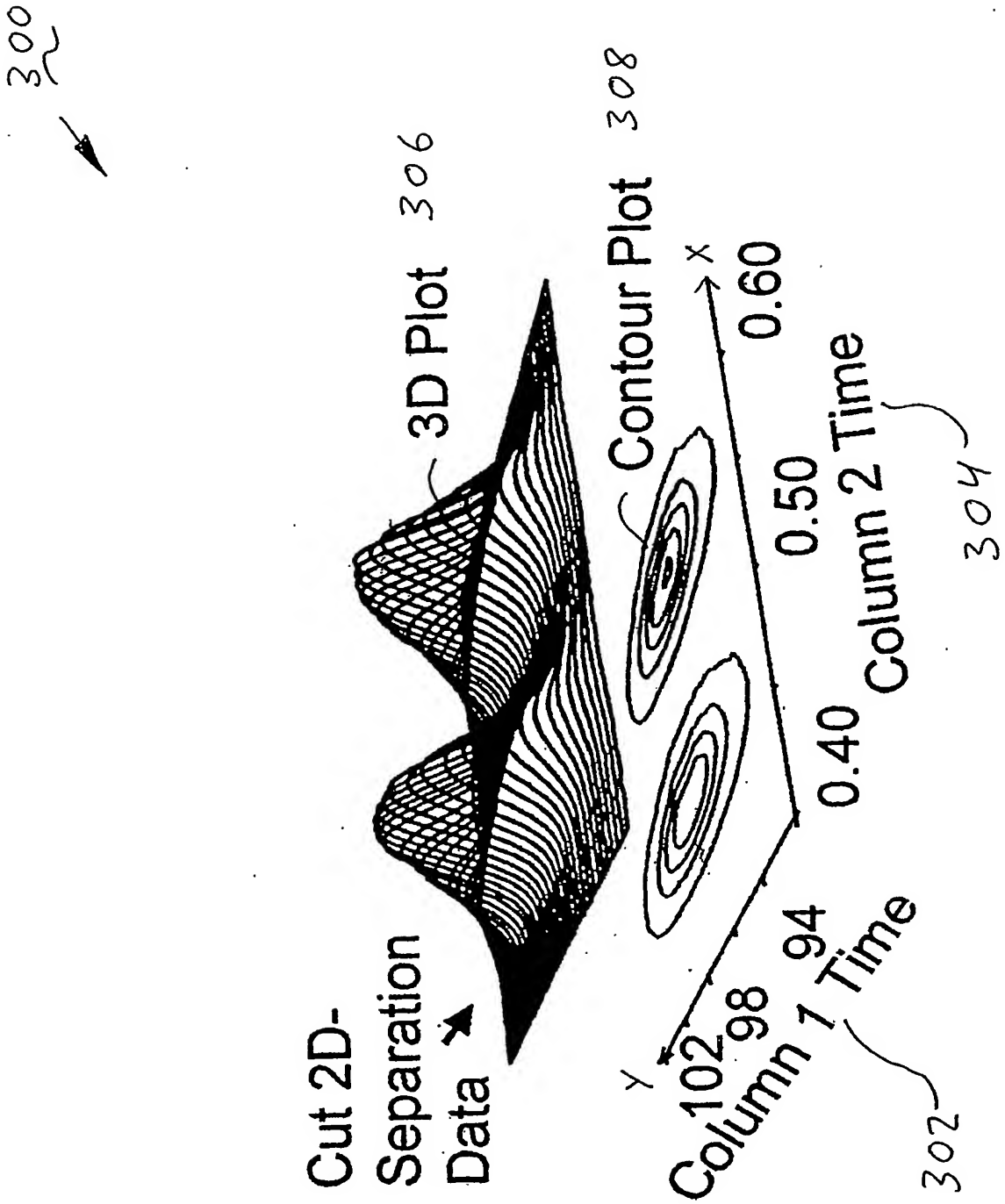

300
Cut 2D-Separation Data
3D Plot
306
Contour Plot
308
X
0.60
0.50
0.40
Column 2 Time
304
Y
102
98
94
Column 1 Time
302

FIG. 3

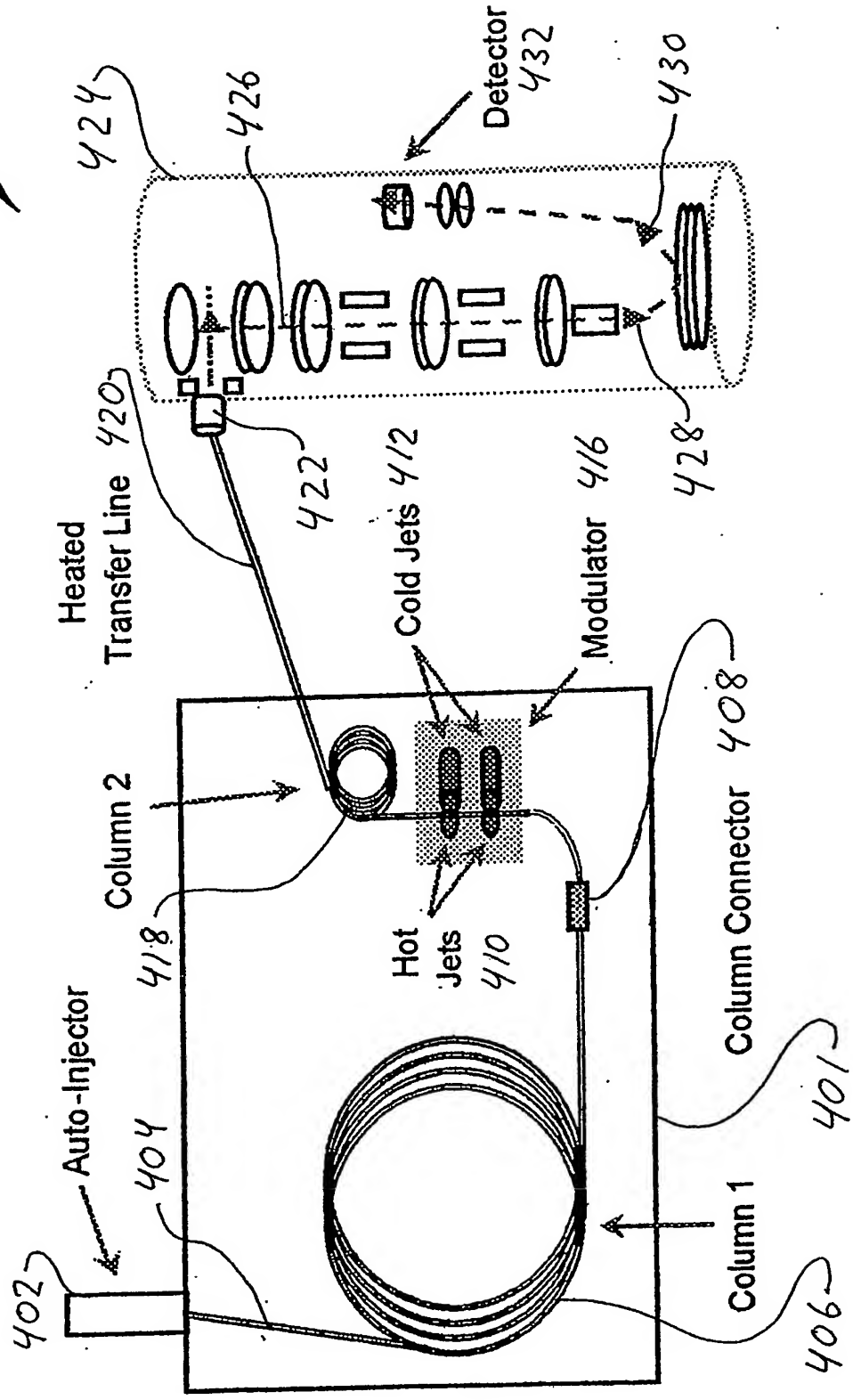
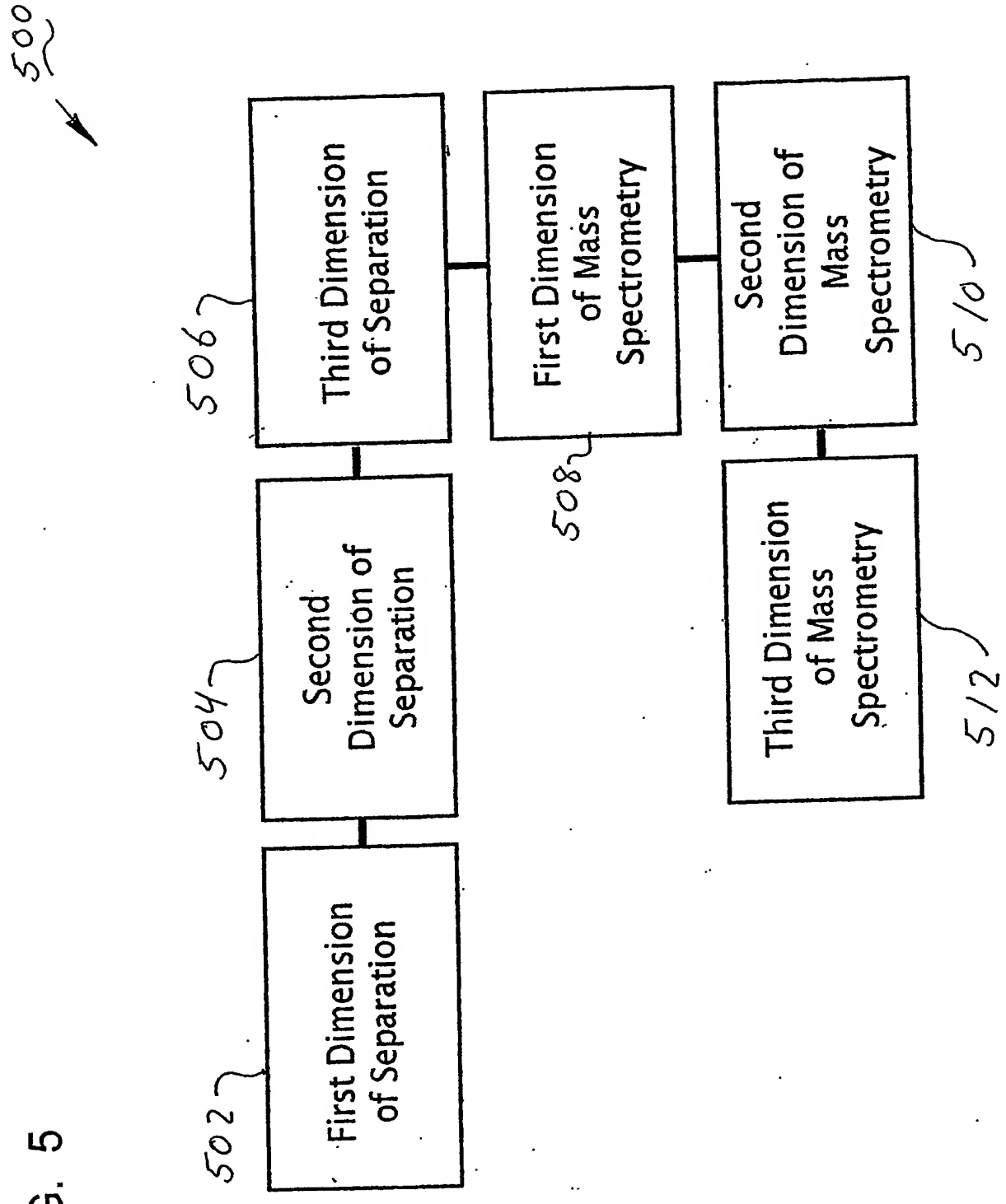

400
424
426
Detector
432
430
420
Heated
Transfer Line
422
412
Cold Jets
416
Modulator
428
408
Column 2
418
Hot
Jets
410
Column Connector
401
Auto-Injector
404
402
Column 1
406

FIG. 4

FIG. 5


500
First Dimension of Separation
502
Second Dimension of Separation
504
Third Dimension of Separation
506
First Dimension of Mass Spectrometry
508
Second Dimension of Mass Spectrometry
510
Third Dimension of Mass Spectrometry
512

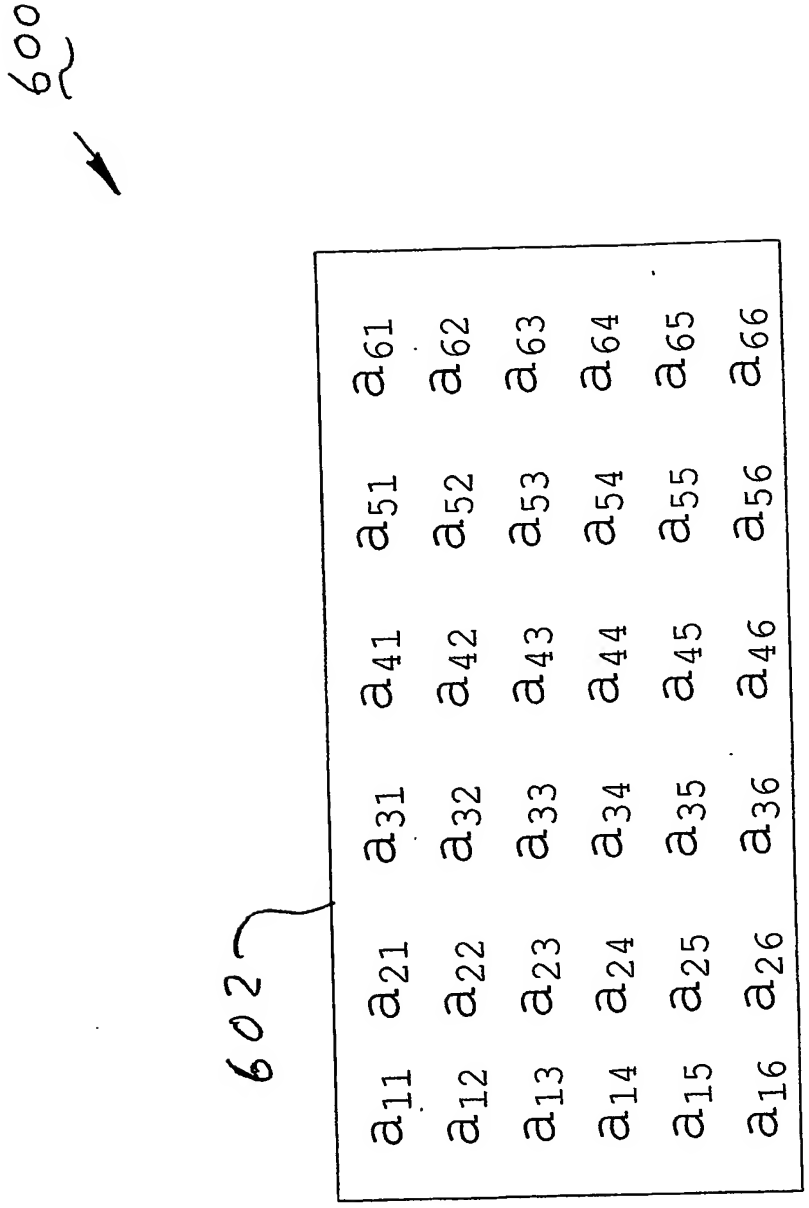
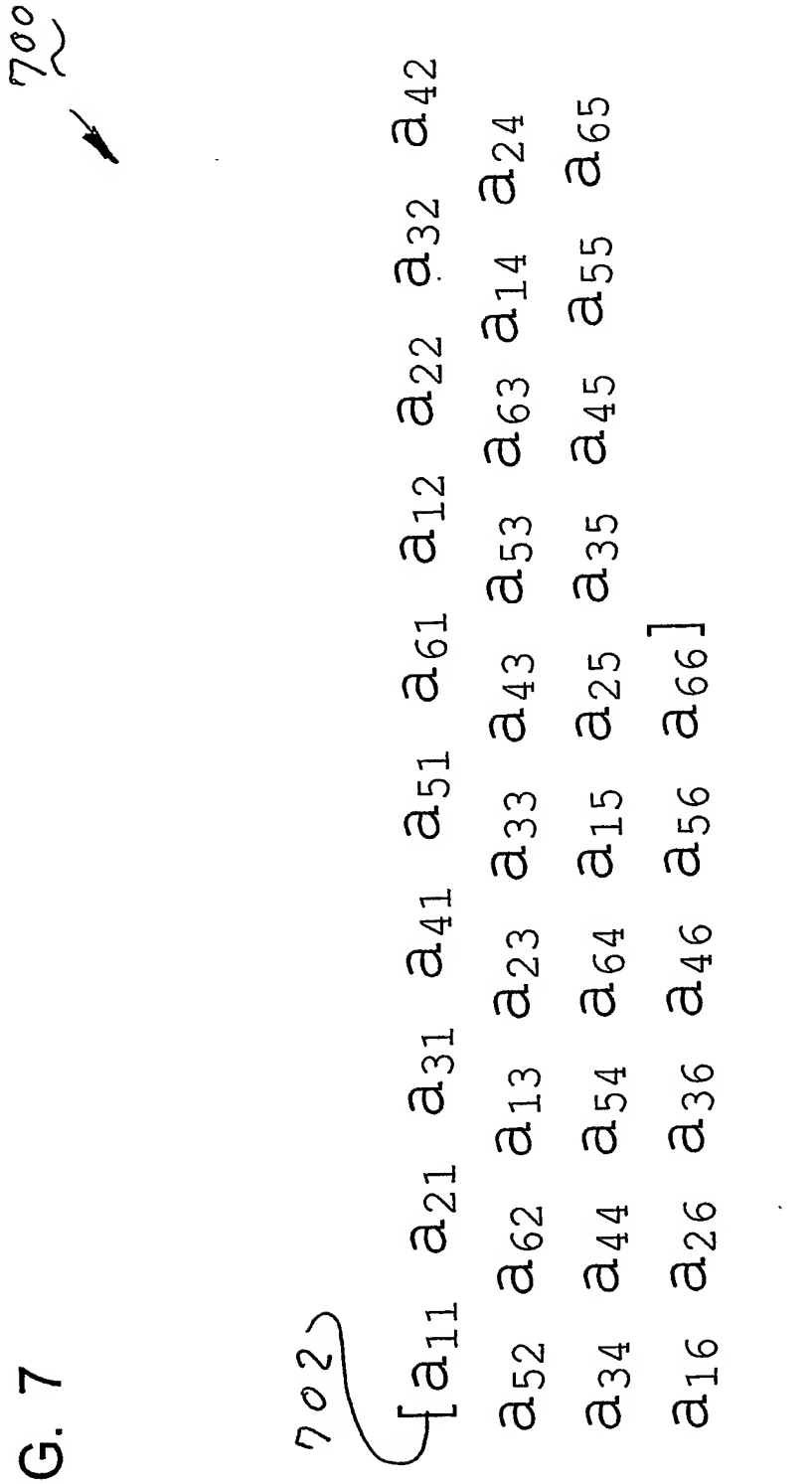

600
602
a11 a21 a31 a41 a51 a61
a12 a22 a32 a42 a52 a62
a13 a23 a33 a43 a53 a63
a14 a24 a34 a44 a54 a64
a15 a25 a35 a45 a55 a65
a16 a26 a36 a46 a56 a66

FIG. 6

FIG. 7


700
702
$\begin{bmatrix} a_{11} & a_{21} & a_{31} & a_{41} & a_{51} & a_{61} & a_{12} & a_{22} & a_{32} & a_{42} \\ a_{52} & a_{62} & a_{13} & a_{23} & a_{33} & a_{43} & a_{53} & a_{63} & a_{14} & a_{24} \\ a_{34} & a_{44} & a_{54} & a_{64} & a_{15} & a_{25} & a_{35} & a_{45} & a_{55} & a_{65} \\ a_{16} & a_{26} & a_{36} & a_{46} & a_{56} & a_{66} \end{bmatrix}$

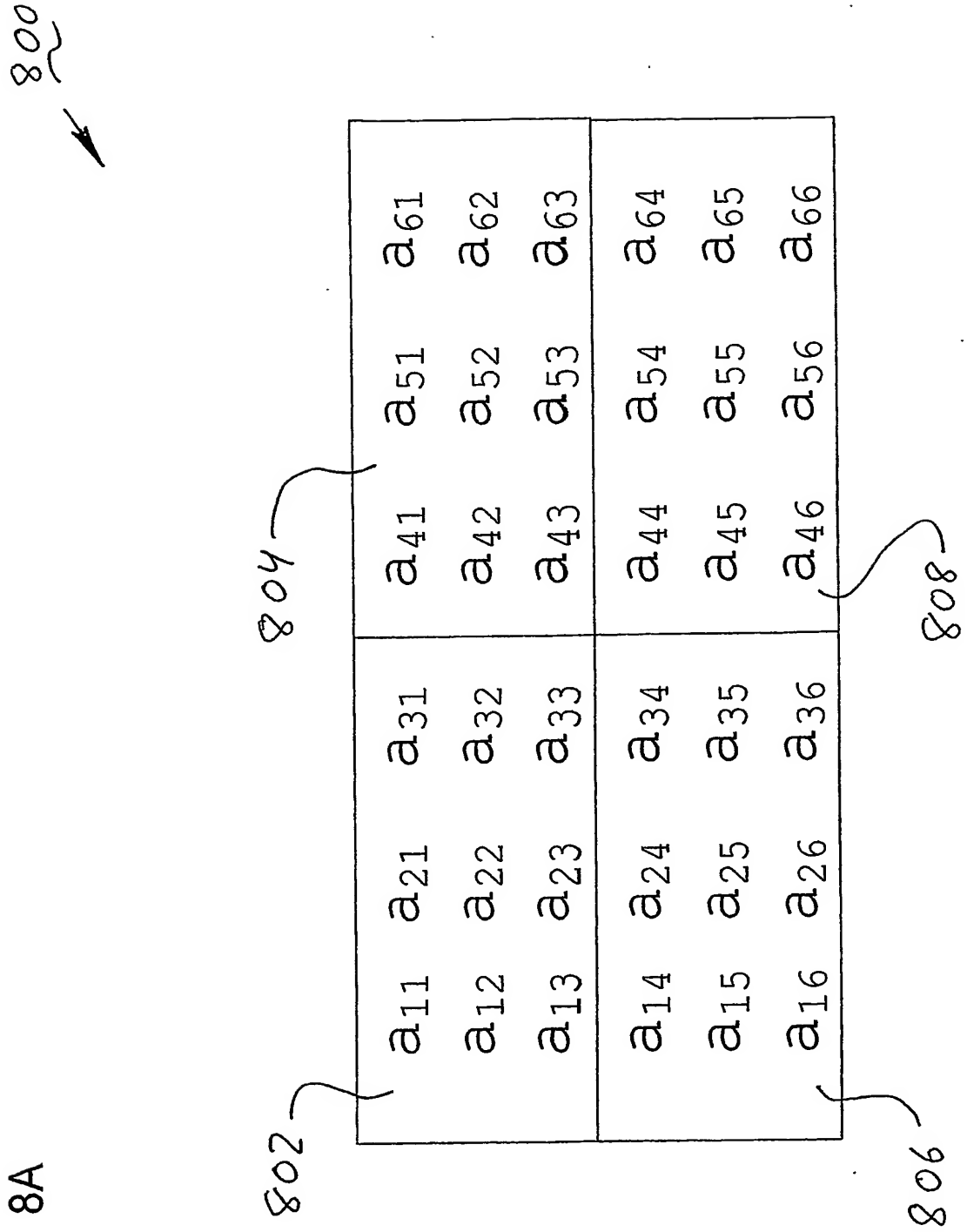

800
802
804
806
808
a11 a21 a31 a41 a51 a61
a12 a22 a32 a42 a52 a62
a13 a23 a33 a43 a53 a63
a14 a24 a34 a44 a54 a64
a15 a25 a35 a45 a55 a65
a16 a26 a36 a46 a56 a66

FIG. 8A

FIGURE 8B

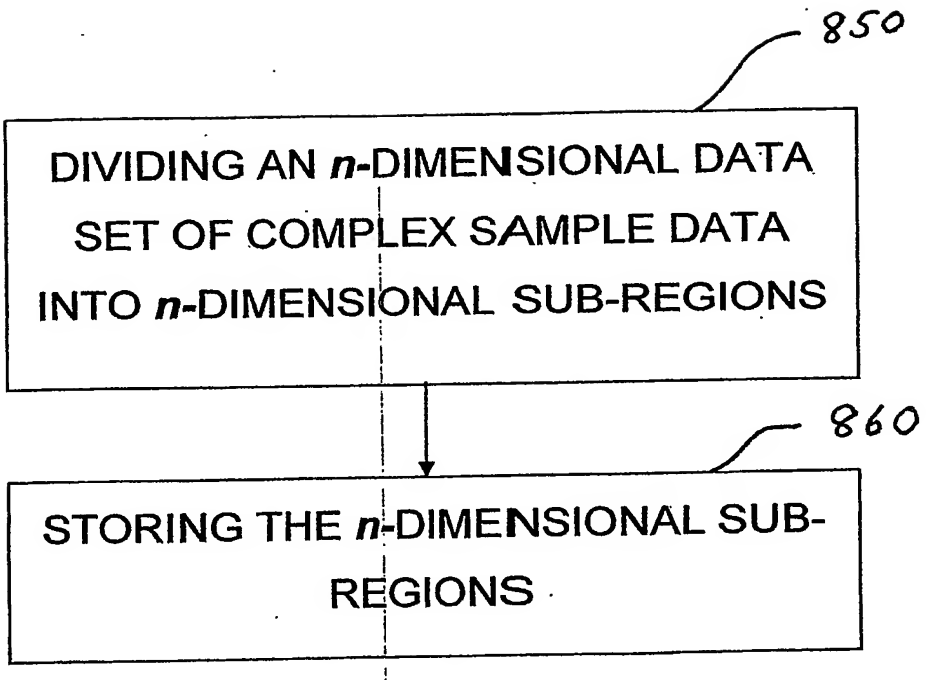

850
DIVIDING AN *n*-DIMENSIONAL DATA SET OF COMPLEX SAMPLE DATA INTO *n*-DIMENSIONAL SUB-REGIONS
860
STORING THE *n*-DIMENSIONAL SUB-REGIONS

FIG. 9

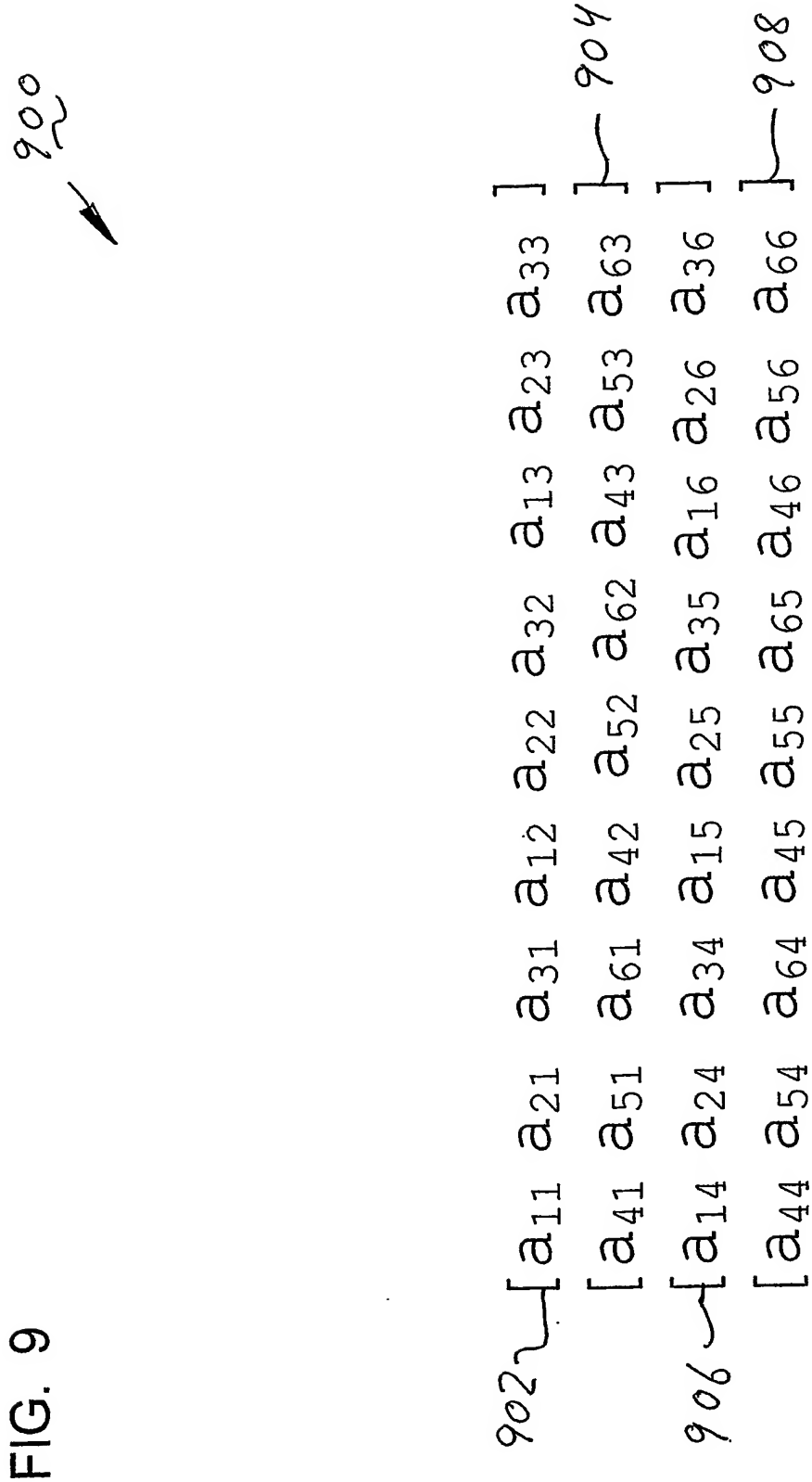
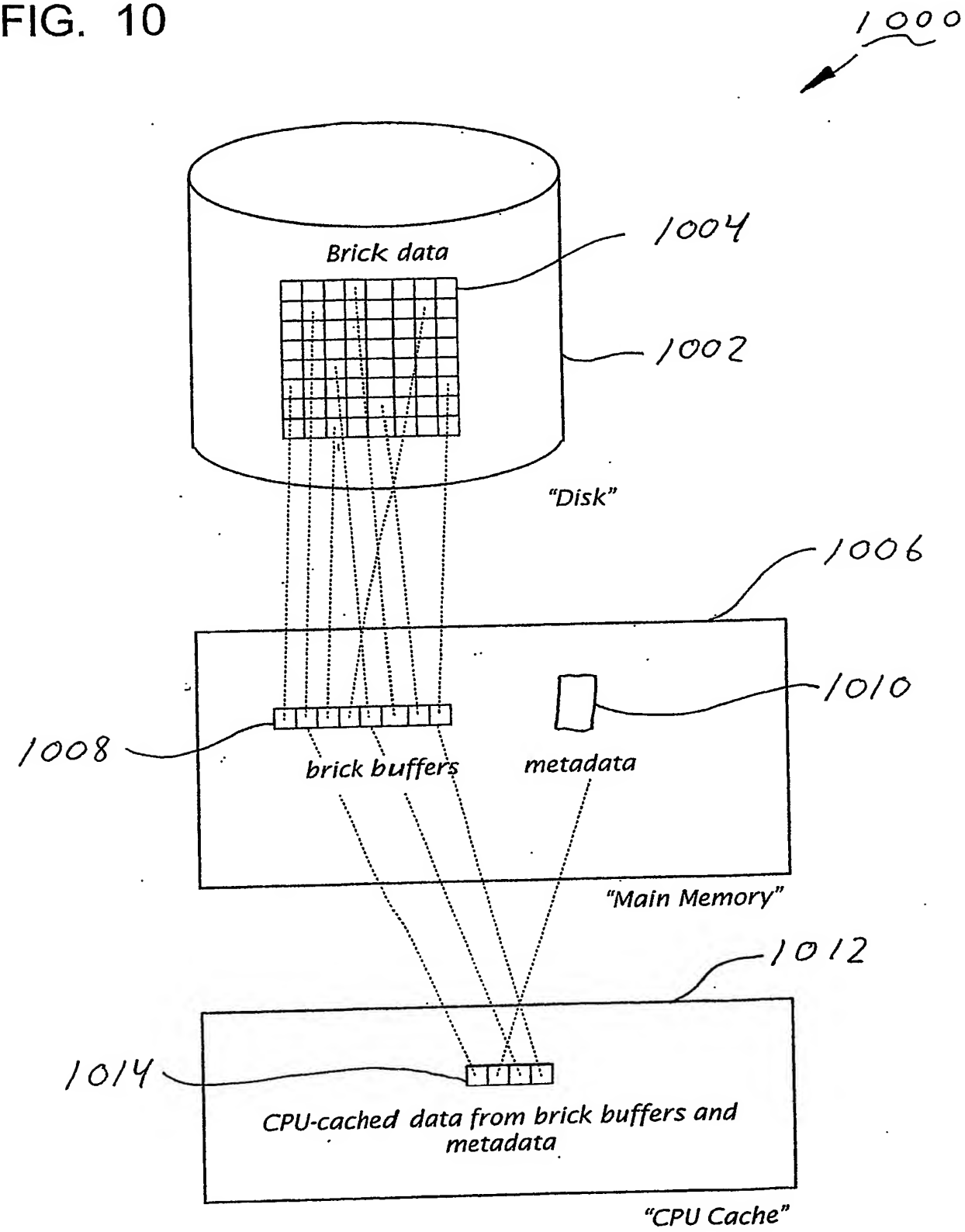

900
902
904
906
908
a_{11} a_{21} a_{31} a_{12} a_{22} a_{32} a_{13} a_{23} a_{33}
a_{41} a_{51} a_{61} a_{42} a_{52} a_{62} a_{43} a_{53} a_{63}
a_{14} a_{24} a_{34} a_{15} a_{25} a_{35} a_{16} a_{26} a_{36}
a_{44} a_{54} a_{64} a_{45} a_{55} a_{65} a_{46} a_{56} a_{66}

FIG. 10


1000
Brick data
1004
1002
"Disk"
1006
1010
1008
brick buffers
metadata
"Main Memory"
1012
1014
CPU-cached data from brick buffers and metadata
"CPU Cache"

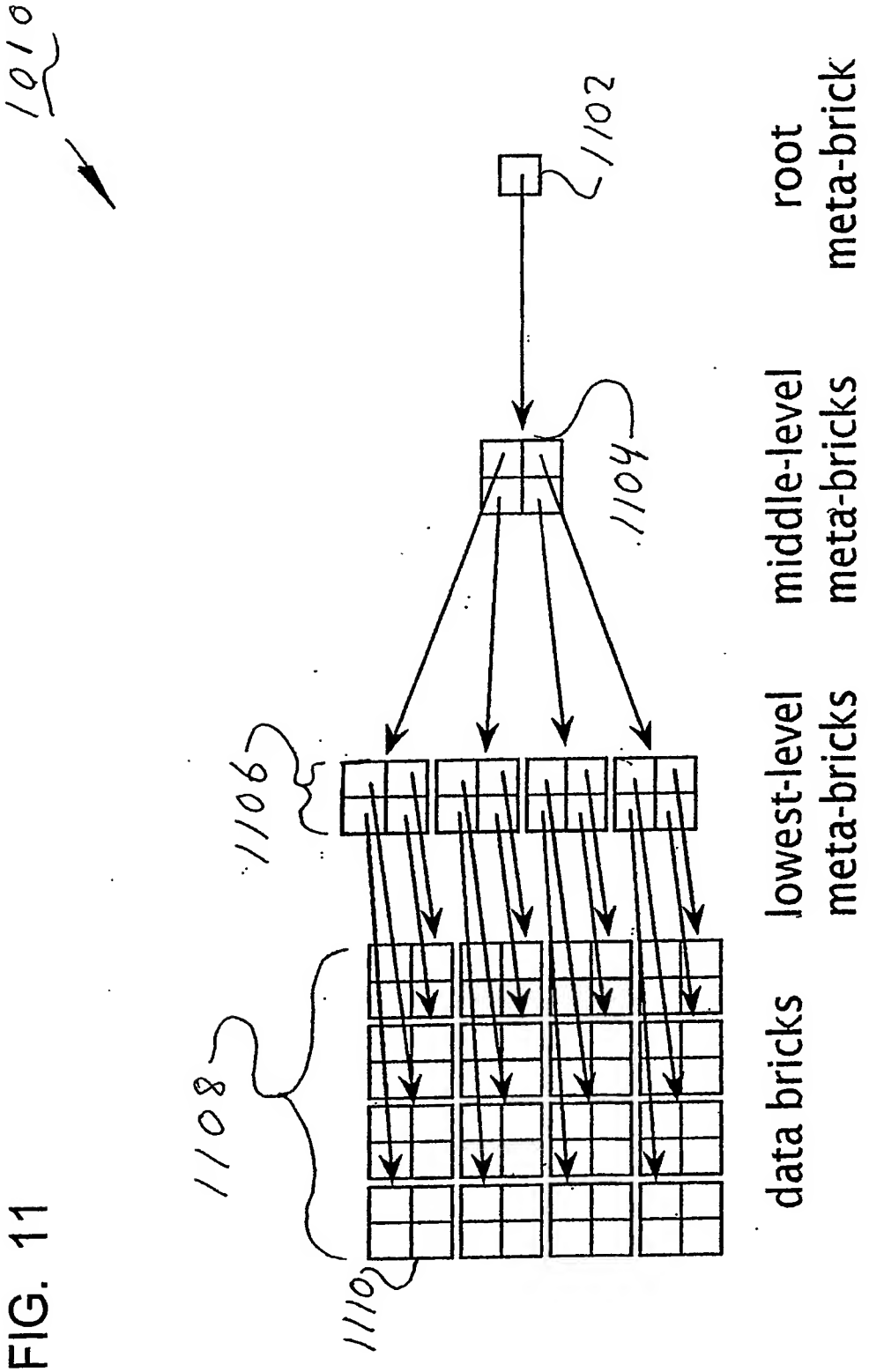

1010
1102
1104
1106
1108
1110
root meta-brick
middle-level meta-bricks
lowest-level meta-bricks
data bricks

FIG. 11

FIG. 12A

1202

1204

(a, b, c)	Unused space (%)
(1,2,2048)	2.4
(2,1,2048)	2.4
(1,4,1024)	2.4
(2,2,1024)	2.4
(1,8,512)	2.4
(2,4,512)	2.4
(2,8,256)	2.4
(1,256,16)	2.4
(2,128,16)	2.4
(1,512,8)	2.4
(2,256,8)	2.4
(1,1024,4)	2.4
(2,512,4)	2.4
(2,1024,2)	2.4
(1,16,256)	3.2192
(2,16,128)	3.2192
(1,128,32)	3.2192
(2,64,32)	3.2192
(1,32,128)	4.8576
(1,64,64)	4.8576
(2,32,64)	4.8576
(4,1,1024)	36.5333
(4,2,512)	36.5333
(8,1,512)	36.5333
(4,4,256)	36.5333
(8,2,256)	36.5333
(4,8,128)	36.5333
(8,4,128)	36.5333
(4,16,64)	37.6256
(8,8,64)	36.5333

1206

FIG. 12B

1202 1204

(a, b, c)	Unused space (%)
(4,32,32)	37.6256
(8,16,32)	35.4752
(4,64,16)	36.5333
(8,32,16)	36.5333
(4,128,8)	36.5333
(8,64,8)	36.5333
(4,256,4)	36.5333
(8,128,4)	36.5333
(4,512,2)	36.5333
(8,256,2)	36.5333
(4,1024,1)	36.5333
(8,512,1)	36.5333
(1,1,4096)	104.8
(1,2048,2)	104.8
(2,2048,1)	104.8
(16,1,256)	173.067
(16,2,128)	173.067
(16,4,64)	173.067
(16,8,32)	168.8
(16,16,16)	168.8
(16,32,8)	173.067
(16,64,4)	173.067
(16,128,2)	173.067
(16,256,1)	173.067
(1,4096,1)	309.6
(32,8,16)	433.333
(32,4,32)	437.6
(32,16,8)	437.6
(32,1,128)	446.133
(32,2,64)	446.133

FIG. 12C

1202 1204

(a, b, c)	Unused space (%)
(32,32,4)	446.133
(32,64,2)	446.133
(32,128,1)	446.133
(64,4,16)	966.667
(64,8,8)	966.667
(64,2,32)	975.2
(64,16,4)	975.2
(64,1,64)	992.267
(64,32,2)	992.267
(64,64,1)	992.267
(128,2,16)	2033.33
(128,4,8)	2033.33
(128,8,4)	2033.33
(128,1,32)	2050.4
(128,16,2)	2050.4
(128,32,1)	2084.53
(256,1,16)	4166.67
(256,2,8)	4166.67
(256,4,4)	4166.67
(256,8,2)	4166.67
(256,16,1)	4200.8
(512,1,8)	8433.33
(512,2,4)	8433.33
(512,4,2)	8433.33
(512,8,1)	8433.33
(1024,1,4)	16966.7
(1024,2,2)	16966.7
(1024,4,1)	16966.7
(4096,1,1)	32375.3
(2048,1,2)	34033.3
(2048,2,1)	34033.3